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Name: Commissioner of Patents

Art Unit: 1742

Examiner: George P. Wyszomierski

Phone: 571 272-1252

From: Richard D. Seibel
Reg No. 22,134

Re: Application No. 10/735,148; Filed December 12, 2003
Entitled IN-SITU DUCTILE METAL/BULK GLASS MATRIX COMPOSITES FORMED BY CHEMICAL PARTITIONING

File: C543:51667

Applicants appreciate the courtesy call from the Examiner on November 17 in connection with the above-referenced U.S. patent application. It is understood that a Declaration submitted in this application is incomplete in the PTO files. One page seems to be missing. Thus,as requested, Applicants are transmitting herewith, a complete copy of William L. Johnson's Declaration Under 37 CFR 1.32.

I HEREBY CERTIFY THAT THIS PAPER IS BEING FACSIMILE TRANSMITTED TO THE UNITED STATES PATENT AND TRADEMARK OFFICE ON **November 21, 2006.**

Sheila K. Harter

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Christie, Parker & Hale, LLP
350 West Colorado Boulevard
Post Office Box 7068
Pasadena, CA 91109-7068
626-795-9900
Fax: 626-577-8800

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Choong Paul Kim, et al.
Application No.	:	10/735,148
Filed	:	December 12, 2003
Title	:	IN-SITU DUCTILE METAL/BULK GLASS MATRIX COMPOSITES FORMED BY CHEMICAL PARTITIONING
Grp./Div.	:	1742
Examiner	:	George P. Wyszomierski
Docket No.	:	51667/RDS/C543

DECLARATION UNDER 37 C.F.R. 1.32

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Post Office Box 7068
Pasadena, CA 91109-7068
August 21, 2006

Commissioner:

I, William L. Johnson, declare and state as follows:

1. I am the same William L. Johnson who signed a Declaration filed in this application on November 11, 2005. I remain a qualified expert as described in that Declaration.

2. The technique described in the above-identified patent application produces a composite material having a ductile crystalline metal phase distributed in an amorphous metal matrix. This is obtained by cooling an alloy from the melt until a second phase forms in situ by homogeneous nucleation throughout the melt and followed by crystal growth. A composite having ductile metal particles precipitated in situ in an amorphous metal matrix exhibits ductility that is not present in a bulk metallic glass. Patterns of shear bands propagate through the amorphous metal matrix and through the ductile particles to produce overall ductility in the composite.

I hereby certify that this correspondence is being deposited with the U.S. Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on
8/21/06
(Date of Deposit)

3. I am a coauthor of the Liu, et al., paper cited of record in the above identified application and relied on by the Examiner in a PTO action dated May 19, 2006. I am familiar with the Liu paper and the materials described therein.

4. In the PTO action it is stated that "the examiner's position is that the prior art materials are sufficiently 'ductile' to meet the generic recitation of this term in the claim in the absence of any numerical meaning of the term 'ductile'." The crystalline phase mentioned in the Liu paper is not ductile, nor is the composite material ductile.

5. The dictionary defines ductile as "capable of being fashioned into a new form . . . capable of being permanently drawn out without breaking . . . capable of being molded or worked . . ." *Webster's Third New International Dictionary.* Neither the crystalline phase nor the composite described by Liu meets this definition.

6. In the Liu paper the crystalline phase is identified as bcc-Mg_7Li_3 which is an intermetallic compound. Intermetallic compounds are notoriously inherently non-ductile and in my opinion the Mg_7Li_3 compound would not be ductile. An engineer is loath to specify any material with a tensile ductility of less than about 5% plastic strain to failure, although under limited circumstances, a material with a tensile ductility of as little as 3% might be acceptable. Thus, anything less than 3% plastic strain to failure would be regarded as non-ductile or brittle by those skilled in the art. A material with a tensile plastic strain to failure of 1%, for example, is not useful for structural purposes where tensile or bending loads are encountered. The composite material described in the Liu paper has strain to failure of substantially less than 1% and is therefore non-ductile, even if as little as 1% plastic strain to failure were thought of as lower limit of "ductility". This is evidence that the Mg_7Li_3 compound is non-ductile.

7. More significantly, the grain (particle) size of the crystalline Mg_7Li_3 phase described in the Liu paper is in the range of 2 to 20 nanometers. Particles of Mg_7Li_3 less than 20 nanometers cannot be ductile, even if the material were inherently ductile. The Hall-Petch phenomenon results in nano-crystalline materials being non-ductile. The critical size limit is 10-20 nanometers. For example, inherently ductile aluminum crystals smaller than 20 nanometers are not ductile, solely because of particle size. No dislocation slip can occur in such nano-crystals Shear bands cannot go through such nano-crystals smaller than 20 nanometers. The critical size limit for inherently ductile copper or iron can be as little as 10 nanometers. The

Hall-Petch critical size limit for a brittle intermetallic compound would be substantially more than 20 nanometers, and that is not the only reason that the material is non-ductile. No appreciable dislocation slip occurs in such non-ductile materials.

I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

William L. Johnson

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